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CONCERNING A FILING UNDER 35 U.S.C. 371

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INTERNATIONAL APPLICATION NO.

PCT/EP96/04212

INTERNATIONAL FILING DATE

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PRIORITY DATE CLAIMED

27 September 1995

TITLE OF INVENTION

METHOD FOR THE SITUATION-DEPENDENT ARRANGEMENT AND/OR ACTIVATION OF RESOURCES

APPLICANT(S) FOR DO/EO/US

Stefan J. HALBLANDER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

COPY

17. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO \$930.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
..... \$720.00No international preliminary examination fee paid to USPTO (37 CFR 1.482)
but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$790.00Neither international preliminary examination fee (37 CFR 1.482) nor
international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1070.00International preliminary examination fee paid to USPTO (37 CFR 1.482)
and all claims satisfied provisions of PCT Article 33(2)-(4) \$98.00**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS** PTO USE ONLY

\$ 930.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	20 - 20 =	0	X \$22.00
Independent claims	1 - 3 =	0	X \$82.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00

\$

\$

\$

TOTAL OF ABOVE CALCULATIONS =

\$ 930.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement
must also be filed (Note 37 CFR 1.9, 1.27, 1.28).

\$

SUBTOTAL =

\$ 930.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

+

TOTAL NATIONAL FEE =

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Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

+

\$ 40.00

TOTAL FEES ENCLOSED =

\$ 970.00

Amount to be:
refunded

\$

charged

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a. ☒ A check in the amount of \$ 970.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. 04-0753. A duplicate copy of this sheet is enclosed.**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Dennison, Meserole, Pollack & Scheiner

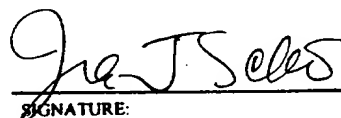
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REGISTRATION NUMBER

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Description

Process for situation-related deployment or activation of resources

The invention refers to a process for situation-related deployment or activation of resources for the completion of operating sequences.

For temporal deployment of complex operating sequences, techniques are used with which individual activities are determined and put in a temporal sequence. The temporal structure of various complex operating sequences running parallel to each other is depicted as a model. The various operating sequences are scheduled activities requiring time or material. On the basis of relative time specifications for individual work operations within the sequences, the subsequent sequence is stipulated with schedules that are absolute but dependent upon the global situation.

In the case of preplanning of operating sequences carried out, for instance, in critical path planning, unpredictable difficulties or events can render planning unusable so that fresh planning for the subsequent operating sequence must be carried out. The latter is complicated and time-consuming and entails, due to a need for time for planning, additional delay in the duration of entire sequence.

Thus in the "Separate Conference Report: Rolling of Flat Products, Symposium of the German Society for Materials Science, Bad Neuheim, D, 21-22 October 1993 (1994) Oberursel, pages 191 through 201, ISBN 3.88355-198-8" a PPS (production planning and control) system is explained with its options and limitations for a rolling mill. It is stated on page 194: "As an ideal solution, a production control system should be attempted which, based on efficient operational data registration, upon any change of previously envisioned plans implements a complete re-optimisation of the entire plan taking the entire relevant environment into account. This means, each change in the process compared with "what should be" entails a new entire planning sequence.

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In the summary, the demand on an optimum PPS system is, that all real-process events are checked for their influence on existing planning and that, where required, fresh integrated planning is implemented. This action would have to be freshly triggered by every event in the process. Such a PPS system can only serve as a specified objective. Real systems are simply for performance reasons not in a position to meet such demands in an up-to-date fashion."

In other words, theoretically a plan, when an unforeseen event occurs, should be changed and replaced by a new plan taking the event into account.

Here is where the invention comes into play which is based on the problem of making available a process for deployment and/or activation of operating sequences, with which process there is such deployment, depending on events, of resources for implementation of operating sequences on the basis of all available resources and of all resources suitable and available at specific times for operating sequences or the resources are so activated that on the basis of the events, operating sequences to be performed can be optimally performed in relation to at least one criterion which can be specified at a given time.

The problem is solved through the invention in a process for deployment or activation of resources for completing operating sequences in the manner that from a series of resources available for implementing the operating sequences specified for performance, at least one resource available in case of an event occurring or existing at one point in time is checked for its suitability and immediate or future availability for one of the operating sequences to be performed, that an operating sequence is selected for at least one resource based on criteria functional to the operating sequences, deploys the resource and then activates it for work or that it at least selects one resource for an operating sequence based on criteria function to the operating sequences, deploys it and then activates it for work.

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A resource here refers to technical installations and facilities but also to organisational units in which human beings are required for carrying out work. With the process just described, orders for work can be optimally deployed and implemented depending on the situation, since the resources are optimally allocated and activated. In doing so, favourable allocation and sequencing of the operating sequences for completing work to be implemented emerges where resources are available. No operating sequences are planned in advance by the process according to a fixed plan by allocating them to the corresponding resources. Deployment of resources occurs in an events-controlled manner. In this way, adequate weight is given to the factual situation of the resources in the light of work to be performed. This factual situation means that upon recognition of the event in question, the availability of resources is taken into account, i.e. it is determined which resources implement certain operating sequences and when the latter are expected to be completed, as well as which resources are free for working. On the basis of this information and of the resources' suitability for performing the work, a decision is then made on their deployment.

In the terms of the invention, for a free resource the operating sequence which is optimum for the resource is selected. Additionally, in the case of non-available resources but of an operating sequence which must be completed, at least one resource is detached from an operating sequence according to at least one functional criterion and is activated for completing the operating sequence exhibiting a more important priority.

In particular, each event is triggered independently or manually according to a specified schedule from stored data or at a time determined by having a limit value exceeded. This event can, for instance, be automatically generated at periodic intervals or on certain calendar days on the basis of stored data. In addition, each event can where required be triggered manually, i.e. via confirmation by the triggering organ. The attainment of certain limit values as well, e.g. meter readings, prioritisation of a job to be carried out, etc. can automatically trigger the event.

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Preferably, events are formed from data generated independently or through manual activation of input elements by technical facilities. For example, events can be triggered by communication-empowered interfaces or by hitting keys or by means of data selected from storage by a programme.

In particular, an event can also be feedback on a resource which has become available or which is available at a particular moment

In a version which is preferred, upon the occurrence of an event, stored master data on resources are checked for their relevance to the event and made available for deployment decision in case of a positive check result with the event related data. In particular, the event-related and deployment-related data are classified and arranged in a class library of jobs. The process steps just described can be referred to as standardisation and classification of events. When certain criteria obtain, standardised and classified events are implemented as orders for operating sequences which are then incorporated into deployment planning. Deployment planning works with jobs which are to be carried out in a specified period of time and calculated according to the above cited criterion or by criteria for implementation periods determined by formal specifications. In particular, classified jobs are checked for priority. Jobs thus prepared are in simulation brought into context with resources suitable for implementation sorted by priority for specific work, where criteria such as resource availability for commencement of the work in question is taken into account.

It is useful, if the resources, if they are available for execution of operating sequences and are intended and suited for such, generate a corresponding message which is the basis for an automatic deployment decision with which a selected resource is activated by means of transmission of the data necessary for the operating sequence in question.

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In a preferred version, the resources generate corresponding signals if:

- a) readiness for operation/deployment obtains.
- b) a job has been terminated.
- c) interruption information has been received for an operating sequence.
- d) an unscheduled interruption of a job occurs,
- e) availability ends.

If corresponding report of the resources is received, the latter is stored and triggers a new deployment procedure by means of which and depending on operating sequences to be carried out by the resources in the period of time in question, data are transmitted for a further job, if such a job is in the library.

It is useful, if jobs can also be deployed by means of manual input of data through specification of implementation deadlines with allocation of resources.

But it is also an advantage, if the deployment decision for jobs for resources can be suspended by removal of the conditional data required for activation of the resources. The possibility thus obtains, if organisation or technical reasons so require, to temporarily suspend execution of jobs or to cancel them definitely.

In the case of a more convenient version, job resources are allocated a series of selectable release flags against whose availability a check is made before forwarding jobs to the resource, where in the case where one or more release criteria are lacking, conditional release for a specified time-frame occurs, within which if one or several criteria lapse, a deployment decision for the job in question is not prevented.

In a further useful version, jobs for resources can be cancelled by input of corresponding data and their processing by simulation. The jobs are then not pursued. In this case, it

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is an advantage if the jobs have been stored with the cancellation flag. If the jobs have already been transmitted to the resources for execution, but execution has not yet begun, instructions for cancellation are transmitted to the resources. Deployment is subsequently deleted.

Resources may be varyingly suitable for execution of certain operating sequences. For this reason, resources are divided into rank orders or classes in regard to operating sequence. It is meaningful here to allocate a major ranking order or class to the resource in question if that resource has been established, intended or is particularly suitable for a specific activity, or a subordinate ranking order or class if the resource can also perform other activities. Each resource thus has a profile indicating for which activities or operating sequences a resource is usable. The resource profile is analysed when the resource is deployed by having first the main ranking order or class and then the subordinate ranking order or class taken into account. In particular, resources are so arranged that they at any given moment can only execute a certain operating sequence which can consist of several process steps. This entails the advantage that the resource, upon execution of the job in question, is then available for additional jobs.

Resources can be stationary or mobile, in which case precautions must be taken that resources are available for data transmission. The job data should preferably be filed automatically. It is furthermore an advantage if jobs indicate a criterion for interruption or suspension. By taking the priority of other jobs into account, jobs can thus be interrupted or suspended and restarted again at a later point in time.

For the purpose of independent deployment, jobs to be executed by means of one or more work operations which can take place in temporal succession or staggered in relation to each other, are determined with indications from out the machine or activity profiles required for their execution and the expected implementation duration.

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A further useful version consists of taking into account various strategies for securing availability of materials or spare parts in respect of time needed for obtaining them and cost-optimised stockpiling.

An advantageous version consists of having strategic corporate objectives taken into account with different weighting as early as when deployment occurs. It is particularly an advantage, if deployment strategy can be adapted to corporate objectives and the preference criteria of

- a) cost optimisation.
- b) scheduling optimisation,
- c) resource utilisation,
- d) quality,

can be varyingly weighted in percentage.

The process constituted by the invention for creation of optimum job sequences and situation-related deployment of resources for completion of operating sequences, can also be characterised such that the process in particular automatically subsequently calculates, from a stochastically changing supply of values not limited in type and scope of jobs to be performed (tasks, work, activities) which are classified in the form of master data and upon the occurrence of trigger events are qualified and standardised by means of specific client master data (point of deployment, type of deployment, starting priorities, guaranteed reaction times, contractual kinds of invoicing), the degree of urgency from differentials between earliest and latest possible starting times and continuously creates a decision-related global priority and which continuously adjusts the latter together with further selected criteria from out of a freely selectable value-stock of strategic corporate data (cost minimisation, material availability, quality, meeting deadlines, resource utilisation, etc) and from the resources (materials, tools,

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manpower) required for implementation and stored in corporate master data, taking the required and freely definable profiles in an ongoing multi-criterial simulation into account with the resource potential made available for completion (likewise freely definable in quantity and capacity) as well as in their profiles and featurisation, and which optionally calculates for each current and future moment the optimum sequences of temporal implementation and allocation of jobs to resources, but which only makes the optimum deployment decision immediately, in case of resource availability, taking the global situation at that moment into account and makes the decision including information relevant to its implementation known to the resources concerned and thereby initiates job execution.

Further details, features and advantages of the invention emerge not only from the claims, the features recognisable from the latter - singly or in combination with each other - but also from the following description of a preferred version example taken from the drawing.

Shown are the following:

Fig 1 a sequential plan of process steps for deployment and/or activation of resources and

Fig 2 a diagram of deployment of jobs whose urgency is plotted on the y axis and whose commencement in time is plotted on the x axis.

The process, whose sequential plan is shown in Fig 1, concerns situation-related deployment and activation of operating sequences, including commercial and information processes, e.g. in connection with service and field service organisations. The operating sequences are executed by resources. Resources are machines, technical installations and facilities, but human beings as well. The process constituting the invention uses labour and service processes without modifying the latter per se. What is affected is the

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allocation and activation of resources which carry out these processes.

A core of the invention is information management in regard to resources. In Fig 1 operating sequences of work processes to be carried out are schematically depicted and designated as 1. Information is transmitted from the resources to a point with a data-processing installation which carries out work processes of deployment and management. An example of a means of transmission given in Fig 1 is a telephone. The transmission step for transmitting data has been designated by 2 in Fig 1. By means of information transmission on the resources' operating sequences, including such operating sequences as standby, rest, repairs, etc, data is received by an operator supervising the deployment and management system or monitoring and controlling the latter. The process of supervision and control is depicted in Fig 1 as 3.

Master data on the operating sequences and related information is stored and, if required, updated by the operator. The process of readout and input of master data is designated in Fig 1 as 4. The master data refer in particular to customers, existing facilities, contracts, operating sequences and resources such as machinery, installations, personnel and materials. Additionally available to the operator are stored information on automatic testing and diagnostic facilities. Readout and input of corresponding information has been designated as 5 in Fig 1.

The operator sets the process for situation-related deployment and control of operating sequences in motion by means of manual input of corresponding data in the data-processing facility. This process is event-controlled, i.e. only the availability of events as well as manual input sets corresponding deployment and/or activation measures in motion.

The events can be automatically recorded or manually identified. Automatic recording is designated as 6 in Fig 1 and occurs by means of data from technical facilities via

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communication-empowered interfaces, e.g. stored-programmable controls, remote control units, etc. Such data transmission is suggested by Step 7 and Fig 1. Manual identification, for example, is input via the screen, for instance in telephone dialogue, recording of a written message/fax, etc.

The events trigger a process step designated in Fig 1 as 8 which comprises optional planning. Step 6, i.e. automatic access to Step 8, can be triggered by so called internal events. Internal events can be permanently specified. In Fig 1 this is designated by means of the activation of master data in a Step 9. The master data relate to events prompted cyclically, for example on every first of the month at 1 pm, or uniquely, for example, on 24/12/1998 at 6 pm, or as a function of metering, for example after 500 hours

External events automatically entailing activation of the system via Step 6 are meter readings, e.g. operating hours, number of items, etc, digital conditions, e.g. disturbances, messages, etc, or the events manually called forth in Step 3. The events are automatically standardised in Step 3 after being recorded and identified.

Standardisation supplements events by adding further deployment related information from the memory of master data. These provide information on:

- kind of activity or technical facilities;
kind of job, e.g. consulting, inspection, maintenance, repairs, delivery, installation, etc;
- point of use / installation;
- type of settlement, e.g. maintenance contract, fixed price, lump-sum, time and effort, warranty, guarantee, good will, special price, travel expenses, etc;
- activities/work to be carried out, work processes and their expected duration,

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- contractually agreed deadlines and schedules (earliest/latest commencement date, completion date, guarantee and warranty periods) etc;
- spare parts required, tools, documentation checking on availability, etc;
- arrival and departure times, once-off setup time, etc;
- resource classes (primary and secondary) needed for implementation;
- further criteria such as starting priorities, special priorities, interruptibility, special resource allocation, etc;
- additional information, e.g. replacement purchasing awaited, competitive situation, degree of satisfaction;
- historical background with indication of capacity/work, possibly causes and outward appearance (damage causes and image), measures taken and references to additional problems;
- key figures on this activity's or these facilities' general quality standards and current comparative data of the activity or technical facility on which the job is based. From this one can draw conclusions, for instance, on the general suitability of such facilities for the special usage in question;
- temporary special identification marks for customers, activities / technical facilities, contracts, materials, resources for support in case of special operations such as serial defects, additional testing, etc;
- release marking for financial accounting;
- release marking for automatic deployment.

After standardisation, the events are classified by criteria and arranged in a class library by job type.

Standardised and classified events can, when all required criterial release flags are in place, automatically trigger jobs. Some release flags have been mentioned by way of example.

Jobs set in motion are automatically likewise absorbed into optional planning in Step 8.

Optional planning is oriented exclusively around the formal criteria of jobs and represents the value stock of work which must be carried out within a period selected for consideration.

Jobs generated in optional planning are subject to a multi-criterial situation designated as Step 10 in Fig 1 which constantly calculates most favourable deployment at a given moment taking certain criteria explained below into account, without actually determining such deployment.

The ongoing situation constantly determines within a selectable time-frame, taking selected criteria into account, for each job its current priority and dynamic modification.

The time-frame and the frequency of simulation actions per time unit are freely selectable and are essentially determined by the use of operating sequences of a particular type.

From the classified job and current priorities the simulation determined for all resource classes usable for implementation and taking formal criteria into account, at what time processing can begin.

A model for deployment is thus permanently available. Jobs float within the formal execution time periods in the model until a deployment decision is made. In this way, it can be recognised at an early stage from what point in time onwards a job becomes critical in respect of its formal criteria. Before that point in time occurs, simulation can investigate other jobs with interruption criteria according to suitable resource classes and propose potential alternatives as a remedy.

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Simulation can prompt automatic notification of these resources, make preparations for their redeployment, send messages about the impending measures to the outside and, if necessary, redeploy itself.

Automatic deployment decision is only made if a resource reports its availability.

A resource must report in the following cases:

1. at commencement of availability (commencement of work);
2. upon re-availability after completion of a job;
3. upon receipt of an interruption flag;
4. for unscheduled interruption of a job;
5. at the end of availability (end of work).

Feedback occurs in a step designated as 11 in Fig 1 and relates to data on implementation time, consumption of materials, errors, damage, downtimes and location of the resource, in which case errors and damage are reported in code. In Step 10, these data are taken into account by carrying out the subsequent Step 12 which is designated as "situation-related deployment." The latter is reported, for example, to the operator by retrieval. Step 11 feedback data otherwise proceed to master data and to simulation, which is designated as Step 13 in Fig 1.

Job data are automatically transmitted in a subsequent Step 14 to the resources.

The transmission of job data can be done immediately via telephone, fax, City-call, modem, ISDN, LAN, etc. or by means of movable data media. The former transmission has been designated as Step 15 in Fig 1, the latter as Step 16. The job recipients, i.e. the resources have been designated as 17. From the latter, by means of 18 designated transmission processes, data for the feedback step are forwarded via telephone, modem,

etc.

If resources report, their data and possible feedback data are calculated from the current job. From this, simulation immediately calculates the new model and transmits data for the next job to the resource.

Resources and deadlines can also be manually deployed in the framework of Step 12, i.e. jobs can be manually deployed within simulation by specifying implementation deadlines and alternately specific allocation of resources from the relevant classes which are explained below.

This is done, for instance, in the case of precise deadline agreements with the recipient of the services or if, for special reasons, specific allocation of resources becomes necessary.

The deployment decision for jobs can be suspended during simulation in Step 10 by removal of the criterial release flags. For this, intervention occurs directly into Step 10.

For organisational or technical reasons, it can become necessary to temporarily suspend processing of a job during simulation, without however definitively cancelling it. This can be done by removal of the criterial release flags.

Jobs with incomplete criterial release flags get conditional release for simulation with reservations made for timeliness.

For a selectable period of time, such jobs in Step 12 are treated as if all criterial release flags obtained. If the missing release flags occur on schedule during the reservation period, such jobs are deployed in accordance with the other criteria.

If occurrence of the missing release flags is delayed beyond the reservation period, such jobs are withdrawn from simulation and put in interim storage for a selectable period of time for manual processing in follow-up. Upon expiry of the period of time in question, these jobs are automatically stored with a flag and deleted from follow-up.

But jobs can be cancelled at any time manually through intervention in Step 10.

In this case, the jobs are withdrawn from simulation and all job data are stored with the cancellation flags.

For jobs whose data are already available to resources for execution, the cancellation flags are transmitted to the resources. Only after this do deletion of deployment and release of the resources occur.

Resources are divided into classes with specific rank orders. The type and number of resource classes should be determined individually for each use. Within the resource classes there are subclasses. Each resource class has only one primary subclass, but may have any number of secondary subclasses.

The resource profiles are criterially and unambiguously allocated to resource classes. The profiles describe for which activities / work processes the resources are usable. The resource classes emerge from the profiles.

Example:

Resource classes:	Resources	Profiles
Vehicle	Passenger car, type	transport of passengers

A resource can have a primary profile and can have additional secondary profiles.

The primary profiles of resources describe the activities / work processes for which the resources are maintained or remunerated, e.g. classification in a machine/cost/rate group. In secondary profiles, activities/work processes are described for which the resources due to constructive features, training/skills, are also usable, but which generally correspond to those of a lower machine/cost/rate group.

The primary resource of a profile is only allocated to one resource class, secondary profiles can be allocated to several resource classes.

In this way, within a resource class, primary and secondary subclasses are formed. The primary subclasses have resources with primary and secondary profiles, while the secondary subclasses exclusively contain resources with secondary profiles.

Deployment in Step 12 first takes primary and then secondary profiles into account.

Ongoing simulation in Step 10 calculates for all jobs and suitable resource classes a model for deployment in the sequential order

1. primary subclasses and primary profiles,
2. primary subclasses and secondary profiles,
3. secondary subclasses and secondary profiles.

Each resource at any given time only processes one job.

In this way, it is assured that each resource upon completion of the current job must provide timely feedback on the latter and is then available for new, situation-related deployment.

Until deployment decision, in principle all available resources with suitable profiles are available for execution of a job. With which resources a job is actually executed is only decided at the moment of deployment decision, more specifically when a resource reports its availability.

Resources can be stationary, e.g. machines, or mobile, e.g. vehicles. By means of suitable means of information transmission, one can succeed in having resources being permanently accessible from the location where deployment is carried out.

The usability of certain performance features of the invention process is determined by the degree of fulfilment of this requirement. For cancelling jobs which have already been transmitted to the resources or for setting up interruption flags, permanent accessibility is a prerequisite.

For all other functions, it suffices if the accessibility of resources is limited to times when new job and resource reporting data must be transmitted.

The data on all jobs are filed away in different data storage units for later reprocessing and evaluation.

The nature and scope of the files is geared to resources, work processes and user requirements.

Formal confirmations for jobs, delivery tickets and invoices can be generated automatically.

The process generates from formal specifications and standardised jobs the required job confirmations by fax or e-mail, produces delivery tickets and invoice records.

In order to fashion the process in an auto-optimising manner, the following measures have been taken:

Job data fed back are constantly being compared with specifications and correction factors are calculated therefrom. The computed correction factors are transmitted to the outside as recommendations and depicted as tendency development.

The process can be controlled in such a way that the correction factors automatically enter into simulation and thus influence the deployment decision model.

Automatic change of master data does not occur. With this performance feature, specifications from master data can be adapted to factual conditions.

Jobs can have several interruption criteria.

The processing of jobs can be interrupted or even cancelled with different criteria. In doing so, the following effects occur:

No	Interruption criteria	Effects
1	High-priority resource requirements	Requirements on all resources with suitable profiles and interruptible jobs
2	Missing release flags after lapsing of conditional release	Job is deleted from simulation
3	Manual cancellation	Job is deleted from simulation/deployment and cancellation flags transmitted to resources carrying them out
4	Removal of release flags during simulation	Deployment decision is suspended pending definite release or cancellation
5	Not scheduled by the resource itself	Notification of the operator, further decisions made manually.

High-priority jobs can, where required, automatically redeploy those with less priority and at least one interruption criterion.

If it appears that high-priority jobs threaten to become critical in regard to formal criteria, simulation proposes suitable countermeasures and in some cases initiates the latter as well. The countermeasures consist of first searching, in low-priority jobs and the interruption criterion "high-priority resource requirements" for suitable resources. If such resources are available there, there is the possibility of proposing the latter as remedial measures.

But it is also possible that simulation initiates redeployment itself by first informing the resources found of the high-priority need and inducing the latter to report their availability.

As soon as a resource subsequently reports its availability, simulation transmits the job data and modifies deployment accordingly. The job thus interrupted can be processed further at a later point in time by the same or, in special cases, by another resource.

Each job has at least one work process.

For situation-related simulation, for every job at least one work process is available. The latter must describe the expected duration of execution and the profile of resources carrying it out.

A work process can have a primary profile and can have additional secondary profiles.

The primary profiles of work processes / activities determine which resources the latter are primarily supposed to carry out. The multiplier for time planned is always 1 (one) for primary profiles.

The secondary profiles of work processes/activities indicate which resources the latter can carry out on the basis of their training/skills. The multiplier for time planned is

always greater than 1 (one) for secondary profiles.

Deployment can take different materials strategies per spare part into account.

Should additional spare parts and materials availability be taken into account, then materials should be indicated by type and quantity. In doing so, it should be noted how the materials strategy has been formulated. If it is to be assumed that all spare parts and materials should be sufficiently and immediately available at all times, then an inventory can be dispensed with.

If different materials strategies have been provided for, e.g. inventory-optimised or order-optimised, then for all deployment times besides inventory the eventually required lead times for purchasing should be taken into account.

Optimisation criteria can be taken into account with varying effects.

With the process constituting the invention, objectives, e.g. cost minimisation, meeting deadlines, resource utilisation, shortest possible access times, quality, etc can be taken into account with different weightings. Depending on the strategy chosen, for example, for deployment the following weighting could be set:

1.	Cost optimisation	60 %
2.	Meeting deadlines	80 %
3.	Resource utilisation	30 %
4.	Quality	20 %.

In weighting, keeping deadlines takes priority over costs. The first deployment priority is put on meeting deadlines. In this way, deployment extends the one-off time of all jobs and deploys earlier.

In the case of two or more available and suitable resources, in the present example the more economic one has been selected.

If there are two or more simultaneously available and suitable resources for a job, the one with the lower workload is chosen.

In this way it is possible to continuously conduct deployment according to corporate strategies.

Adaption can flexibly be made to different requirements and organisations.

The process is not bound to a specific organisational form but is adaptable to any sector. The resource class and profiles can be freely shaped. Work processes can be one-step or multi-step. Sub-jobs can likewise be taken into account.

The operating calendar is adaptable to all kinds of working models and regulates resource availability.

The transmission of job and feedback data as well as permanent accessibility of resources is done through utilisation of existing public communications networks.

Fig 2 shows a diagram for different jobs to be performed. Urgency is represented along the y-axis.

The x-axis corresponds to the time axis. Indicated is in each case for different jobs, designated as 1 through 5, the earliest and latest starting time in connection with the relevant resource, marked by encircled numbers.

The advantageous properties of the process constituting the invention essentially consist in the fact that:

- it reacts exclusively in an event-controlled manner;
- it processes trigger events internally and externally;
- events are automatically recorded or manually identified;
- upon being recorded or identified, the events are automatically standardised;
- standardised events can automatically trigger jobs;
- jobs set in motion are automatically absorbed by optional planning;
- from this, an ongoing multi-criterial situation constantly calculates optimum deployment for the moment without however actually making a decision hereon;
- an automatic deployment decision is only then made if a resource has been reported as available;
- the job data are automatically transmitted to the resources;
- resources and deadlines can be deployed manually;
- deployment decisions for jobs can be suspended during simulation by removal of the criterial release flags;
- for jobs with incomplete criterial release flags, release for simulation occurs with the conditional reservation of timeliness;
- jobs can be cancelled at any time;
- resources are divided into classes;
- the resource profiles are criterial and can be unambiguously allocated to resource classes;
- a resource may only have one primary profile but any number of secondary profiles;
- every resource must be allocated to a resource class by primary profile and may be allocated to additional resource classes by secondary profiles;
- deployment first takes primary and then secondary profiles into account;
- each resource at any given time processes a maximum of one job;

- all degrees of freedom are maintained until deployment;
- stationary and mobile resources are constantly accessible;
- all job data are automatically filed;
- formal confirmation for jobs, delivery tickets and invoices is generated automatically;
- it is auto-optimising;
- jobs can have several interruption criteria;
- high-priority jobs can automatically redeploy those with lower priority and at least one interruption criteria if necessary;
- each job must have at least one work process;
- a work process must have precisely one primary profile and can have additional secondary profiles;
- deployment of different materials strategies per spare part can be taken into account;
- strategic corporate objectives (cost minimisation, meeting deadlines, resource utilisation, shortest possible access times, quality, etc) can be taken into account with different weightings;
- it can be flexibly adapted to different requirements and organisations.

The resources available at the time of deployment decision are deployed taking their profiles into account according to optimal criteria.

The disadvantages of advanced planning are avoided with the process which constitutes the invention, because

- the value-stock and conditions for work to be performed (nature, duration, resources needed, earliest/latest possible starting time) constantly change with each additional job,

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- the availability of the resources changes in an unpredictable form (exceeding plan times, traffic situation, technical and human shortcomings, etc).
- possible changes in situation are not predictable and the means of planning thus fail.

[illegible]

ClaimsProcess for situation-related deployment or activation of resources

1. Process for situation-related deployment or activation of resources for completion of operating sequences,
characterised by the fact that,
from a series of resources available for executing specified operating sequences, one resource available in an event occurring or obtaining at a point in time is checked for its suitability and immediate or future availability for one of the operating sequences to be executed, that for that resource an operating sequence is selected based on functional criteria of the operating sequence, the resource is deployed and then activated for work or that the resource is selected for an operating sequence based on functional criteria of the operating sequence, deployed and then activated for work.
2. Process in accordance with Claim 1,
characterised by the fact that,
the event in question is triggered independently or manually according to a specified schedule from stored data or at certain times by means of exceeding limit values.
3. Process in accordance with Claims 1 and 2,
characterised by the fact that,
the events are formed from data generated by technical facilities independently or through manual activation of input elements.

4. Process in accordance with one or more of the previous Claims, characterised by the fact that, after occurrence of an event, stored master data independently check resources for their relevance to the event and in the case of positive results, the resources are made available for deployment decision with event-related data.
5. Process in accordance with one or more of the previous Claims, characterised by the fact that event data standardised and classified by master data as jobs for operating sequences are subject to optional planning which constantly from formal job criteria determines the ones which must be executed within a period of time selected.
6. Process in accordance with one or more of the previous Claims, characterised by the fact that, resources, when they are available, have been intended or set up to generate a corresponding message which is evaluated by simulation for generation of a deployment decision.
7. Process in accordance with one or more of the previous Claims, characterised by the fact that, the resources in each case generate a message at commencement of their availability and at the end of one of the work processes which they have carried out and in the case of interruption information as well as of unscheduled interruption and upon lapse of availability.
8. Process in accordance with one or more of the previous Claims, characterised by the fact that,

through simulation, dynamic priorities of all optional jobs are constantly being determined for the period of time selected and taking into account current job and resource properties at the time of availability notice of the resources deployment decisions are made independently and the selected jobs are forwarded to such resources for execution.

9. Process in accordance with one or more of the previous claims, characterised by the fact that, by means of manual data input, implementation deadlines are deployed with allocation of resources.
10. Process in accordance with one or more of the previous Claims, characterised by the fact that, the deployment decision for jobs to resources can be suspended by retraction of the necessary conditional data required for resource activation.
11. Process in accordance with one or more of the previous Claims, characterised by the fact that, a series of selectable release flags are allocated to jobs for resources, which are checked for their availability prior to forwarding the job to the resources, and that in the event that one or more release flags are lacking, conditional release occurs for a specified period of time, within which, upon the lapse of one or more of the missing criteria a deployment decision is not prevented for the job in question.
12. Process in accordance with one or more of the previous Claims, characterised by the fact that, jobs for resources can be cancelled by input of corresponding data and their processing by means of simulation.

13. Process in accordance with one or more of the previous Claims, characterised by the fact that, the resources are divided up into classes according to their properties for executing operating sequences.
14. Process in accordance with Claim 13, characterised by the fact that, each resource has at least one main class relating to its particular suitability for the operating sequence in question and possibly also sub-classes relating to at least less suitability for an operating sequence than at least another resource, which is allocated to the main class for this operating sequence.
15. Process in accordance with one or more of the previous Claims, characterised by the fact that, the resources in each case execute a certain job at a certain time.
16. Process in accordance with one or more of the previous Claims, characterised by the fact that, the resources can be stationary or mobile.
17. Process in accordance with one or more of the previous Claims, characterised by the fact that, as criteria for optimisation, costs, meeting deadlines, work load and quality of the operating sequence are provided for, singly or jointly.
18. Process in accordance with one or more of the previous Claims, characterised by the fact that, job data fed back are compared with specified job data and that from discrepancies correction factors for optimising operating sequences are determined.

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19. Process in accordance with one or more of the previous Claims, characterised by the fact that, jobs manifest one or more interruption criteria which are taken into account when allocating priorities.
20. Process in accordance with one or more of the previous Claims, characterised by the fact that, an event is the availability of a resource or its notification as an available resource.

[illegible]

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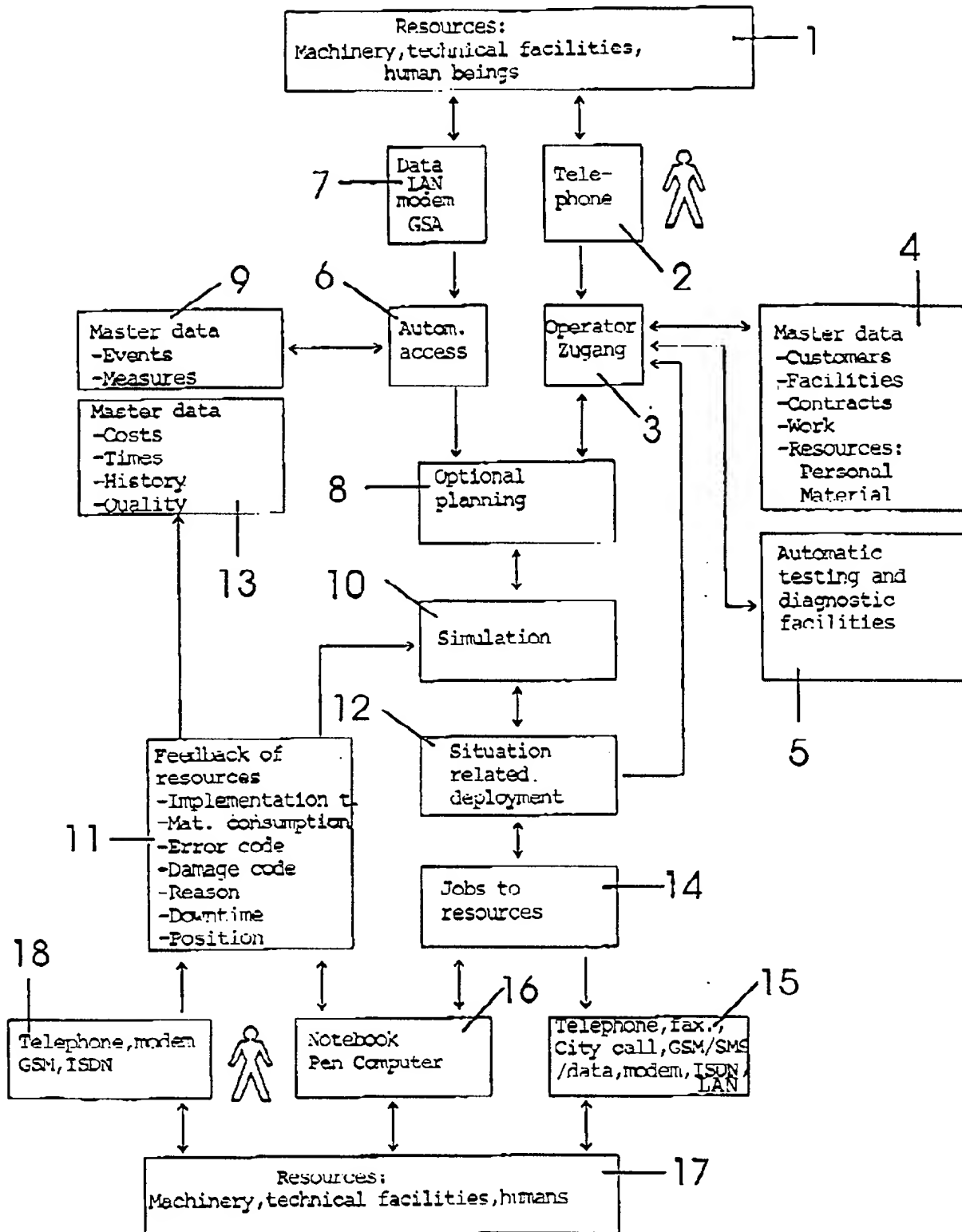
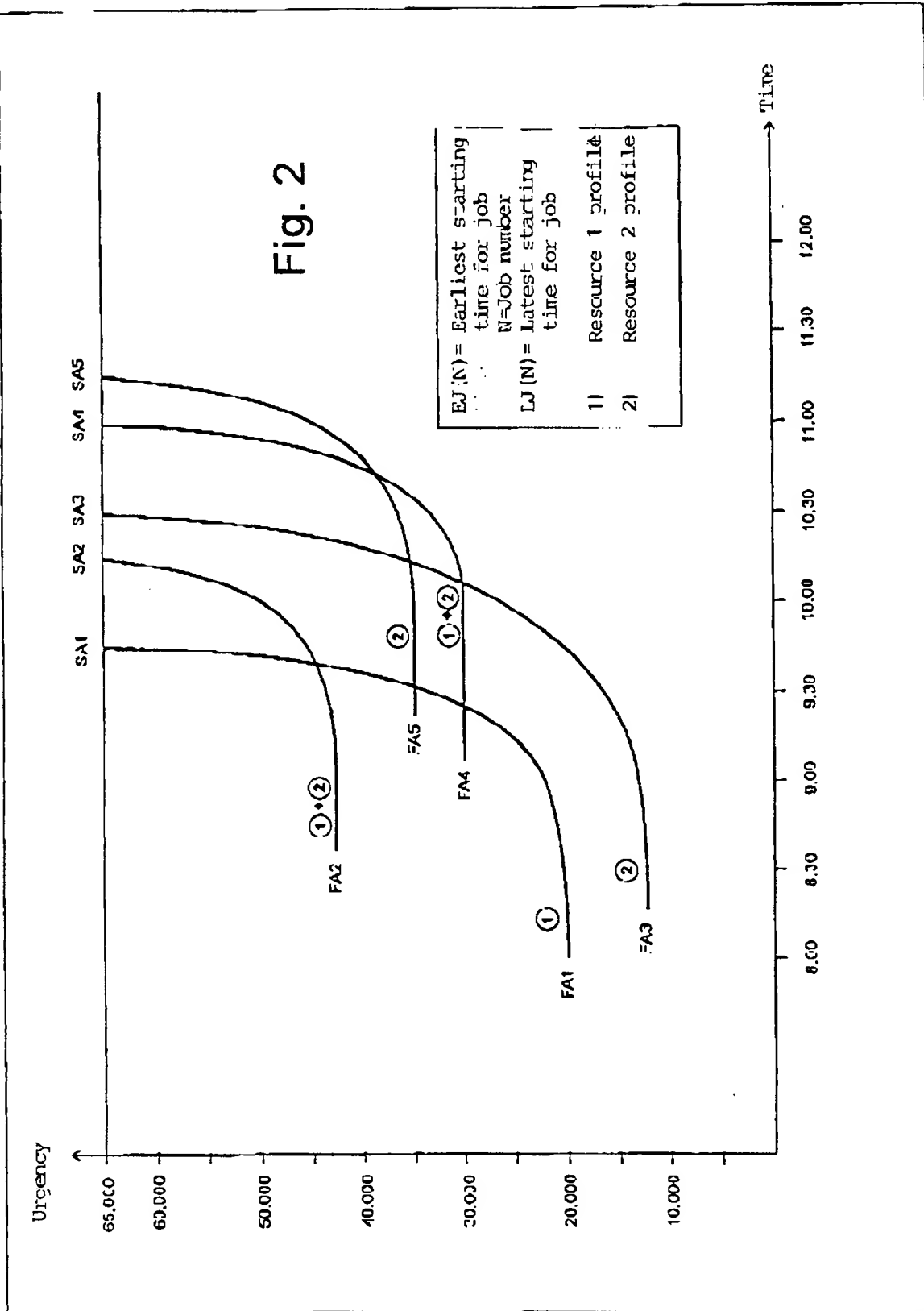


Fig. 1

09/043574



DECLARATION FOR PATENT APPLICATION

Docket No. _____

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled Method For The Situation-Dependent Arrangement And/Or, the specification of which Activation of Resources

(check one) ☒ Is attached hereto.

☐ was filed on _____
Application Serial No. _____ (if applicable).
and was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
PCT/EP 96/04212	WO	26. 09. 1996	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)		
195 35 662.6	DE	27. 09. 1995	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)		
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status—patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status—patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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703 521-1155

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Stefan J. Halbländer
Inventor's signature: [Signature] Date: 24 Feb 1998
Residence: Brachstrasse 64 Citizenship: German
Post Office Address: D-69198 Schriesheim DEX
Full name of second joint inventor, if any: _____
Second inventor's signature: _____ Date: _____
Residence: _____ Citizenship: _____
Post Office Address: _____

(Supply similar information and signature for third and subsequent joint inventors.)

09/043574

Dkt. 98037

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

STEFAN J. HALBLÄNDER

PCTSerial No.: none assigned
(PCT/EP96/04212)

Filed: Concurrently Herewith

For: METHOD FOR THE SITUATION-DEPENDENT ARRANGEMENT
AND/OR ACTIVATION OF RESOURCESPRELIMINARY AMENDMENTHonorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Before calculation of the filing fee, please amend
the above-identified application as follows:IN THE CLAIMS:Please amend the claims, incorporating the claims
attached to the International Preliminary Examination Report,
as follows:

Claim 3, line 1, change "Claims 1 and 2" to

--Claim 1--.

Claim 4, line 1, change "one or more of the previous

Claims" to --Claim 1--.

Claim 5, line 1, change "one or more of the previous Claims" to --Claim 1--.

Claim 6, line 1, change "one or more of the previous Claims" to --Claim 1--

Claim 7, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 8, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 9, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 10, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 11, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 12, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 13, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 15, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 16, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 17, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 18, line 1, change "one or more of the previous Claims" to --claim 1--.

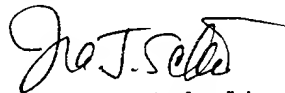
Claim 19, line 1, change "one or more of the previous Claims" to --claim 1--.

Claim 20, line 1, change "one or more of the previous Claims" to --claim 1--.

REMARKS

The claims have been amended to delete the multiple dependencies.

Respectfully submitted,



Ira J. Schultz
Registration No. 28666